Product Manager
Petroleum and Water Systems

Symposium II
Program Review

Presented by:

COL Philip R. LoSchiavo
Product Manager
Petroleum and Water Systems (PAWS)

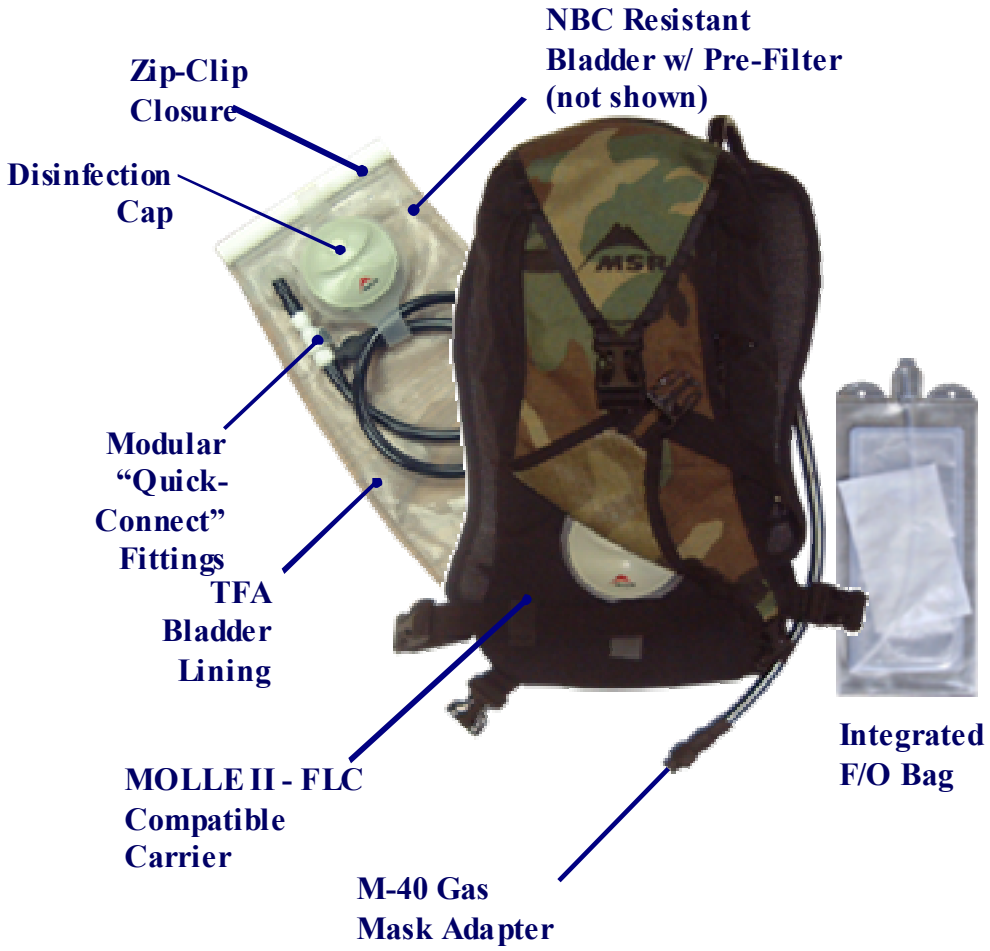
Agenda

- R&D
- Water Purification
- Distribution Systems
- Quality Surveillance
- IPDS
- Transitioned Items
- Summary

R&D

Next Generation Hydration System

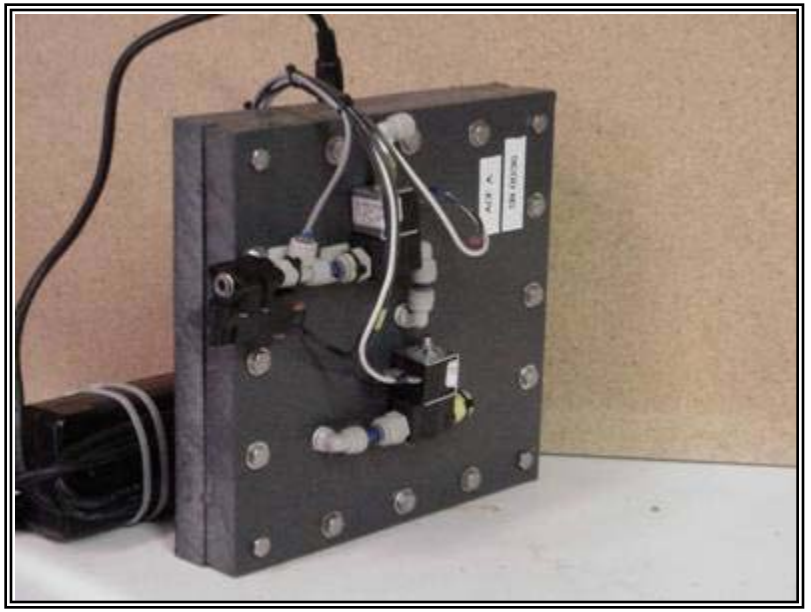
- Develop an integrated "on the move" purification system:
  - Meets NBC standards
  - Meets applicable EPA standards
  - Interfaces w/ military gear
  - Treat 300 L of water before replacement.
  - 2.0 Liter capacity, < 1.0 Kg dry weight.
  - Generate 1.0 L of potable drinking fluid (from seawater) in 15 minutes.
- Potential applications:
  - Fast & light backpacker market.
  - Hydration gear for military personnel.
  - Hydration gear for law enforcement personnel.
  - Disaster/Refugee relief



Highly-Efficient, Low-Power Water Purification Technologies

BACKGROUND/OBJECTIVES

- Current capabilities can produce sufficient quantities of potable water from any source **but**
  - Large demand for logistics support (fuel, filters, chemicals)
  - Relatively large, heavy systems create deployment challenge
- Develop and Demonstrate Innovative Highly-Efficient, Low-Power Water Purification Technology
- Reduce the Size and Weight of Water Producing Equipment by 25% While Reducing Operating Cost by 20%
- Reduce the Logistics Burden to Support Water Purification Equipment
- Enable the Development Easily Deployable Modular and Small Unit Water Purifiers



STATUS

- Conducted Applied Research and System Development to Transition Research Conducted by the Defense Advanced Research Project Agency (DARPA)
- Flow Through Capacitor Demonstrated 64% Energy Recovery
- Development and Testing of New Electrode Materials
- Flow Through Capacitor Demonstrator purified seawater and reduce conductivity of exhaust condensation by 92-99%
- Advanced Spacer Technology Demonstrated in 2.5" RO Elements and Under Going Testing
- Forward Osmosis Membrane Selection, Testing, and Development Underway

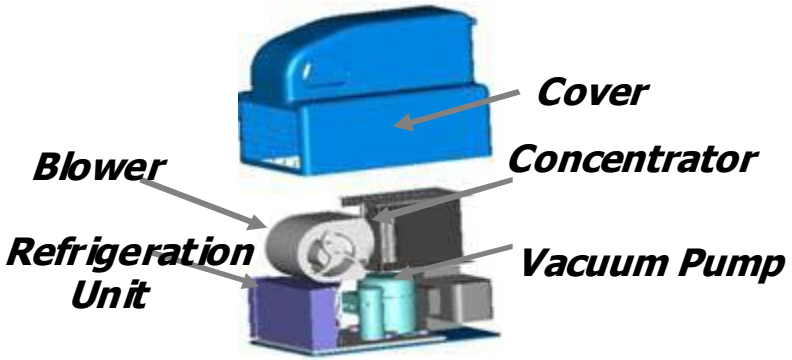
TECHNOLOGY

- **Capacitive Deionization using energy recovery and advanced electrode materials**
- **Forward Osmosis and Enhanced Reverse Osmosis.**

Water From Atmospheric Humidity

BACKGROUND/OBJECTIVES

- Water is Projected to be 40% of the daily sustainment requirement (106 tons) for the SBCT
- Development of a Distributed (Point of Use) Water Sustainment Capability
  - Will Augment Water Supplies and Potentially Extend Water Resupply From a Daily to Weekly Event
  - Increased Flexibility, Mobility, and Deployability Through the Elimination of Ties to Traditional Water Sources
  - Address the critical challenge of water logistics - distribution
- The Atmosphere and Humidity in Confined Operational Spaces (e.g. Vehicle Crew Compartments) is an Attractive Source of Water
- Water can be produced in dry environments where it is needed rather than at a source
- **Water Produced is largely free of contaminants**
- **Logistics of water Transportation are Eliminated**



TECHNOLOGY

- Advanced Surface Chemistry Modified Activated Carbons are extremely effective hydrophilic water vapor absorbers

STATUS

- Conducted Applied Research and System Development to Transition Research Conducted by the Defense Advanced Research Project Agency (DARPA)
- Different Activated Carbon Surface Chemistries have been Fabricated and Tested
- Promising Activated Carbon Chemistries have been inserted into a novel system design incorporating energy recovery to demonstrate humidity concentration

Tasks	FY02	FY03	FY04	FY05	FY06
• Breadboard validation of selected DARPA technologies in laboratory		TRL 4			
• Breadboard demonstration of successful technologies in relevant environment			TRL 5		
• Demonstration of platform mounted and stand alone prototypes					TRL 6

Water From Exhaust

BACKGROUND/OBJECTIVES

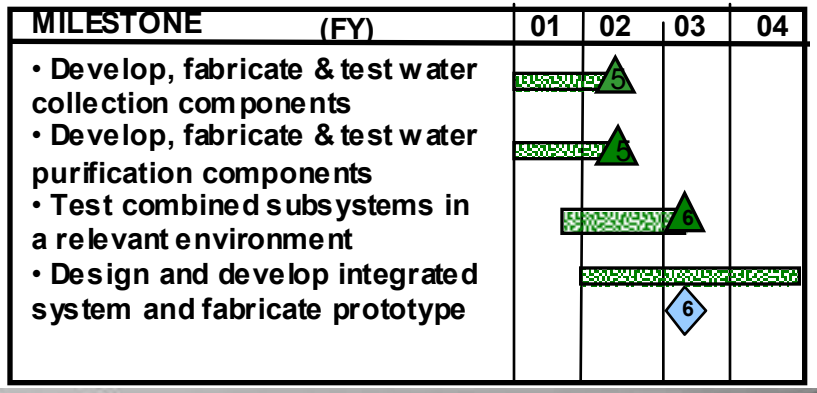
- Water is Projected to be 40% of the daily sustainment requirement (106 stons) for the SBCT
- Development of a Distributed (Point of Use) Water Sustainment Capability
  - Will Augment Water Supplies and Potentially Extend Water Resupply From a Daily to Weekly Event
  - Increased Flexibility, Mobility, and Deployability Through the Elimination of Ties to Traditional Water Sources
  - Address the critical challenge of water logistics - distribution
- **Combustion of 1 Gallon of Fuel Produces ~1 Gallon of Water**
- Water Collected is Contaminated with Combustion By-products
- Size & Weight of System Defines Feasibility
- Efficiency of Water Recovery
- Impact of engine performance and efficiency

STATUS

- Initiated Under a SBIR Program, Received DARPA Supplemental SBIR, transitioned to STO
- Counter Current HX Reduced Size by 40%
- Recovered up to 90% of Theoretical Maximum Water Available, Consistently Recovered 50 to 60%
- Demister Size Reduced by 83%
- Purified Water Met TB Med 577 and EPA Drinking Water Quality Standards
- Installation of New Catalytic Converter Reduced TOC Loading: Will Reduce Unknown Organics Concentration and Filter Size
- Developing Sensor (UV or Conductivity) to Determine When Filter Cartridge Expended

TECHNOLOGY

- Advanced Mesochannel Counter Current Heat Exchanger Reduces Size
- Purification Device Consisting of Novel Activated Carbon Fiber Combined with Ion Exchange Resins and Filtration



MIOX Electrolytic Disinfection

DESCRIPTION:

- Produces a mixed oxidant disinfectant that is more effective than chlorine or iodine
- Miniaturized MIOX technology fits in "pen" or "cap" form
- Removes or inactivates all microbial contaminants (bacteria, viruses, and protozoan cysts) to below drinking water standards
- Purifies 300 quarts using standard 123 lithium camera batteries
- Requires only salt & water no hazardous chemicals
- System weight 4 to 8 ounces depending on configuration

BENEFITS:

- **Fast acting with no bad taste and outstanding performance**
- Filters cannot remove viruses and chlorine/iodine cannot remove protozoan cysts – MIOX removes all microbial contaminants
- Shorter treatment time (10 minutes) than chlorine (30 minutes)
- Rugged, durable, reusable device that will purify 25 quarts between salt tablet replacement and 300 quarts before battery replacement

OPERATION:

- Fill electrolytic cell with a tablespoon of water
  - Pour water into pen
  - Draw water into cap with miniature pump
- Replace cap and mix salt and water (shake pen)
- Activate cell by turning on
- Wait until indicator (LED light or vibrator) signals disinfectant created about 10 to 30 seconds
- Add oxidant to canteen
  - Pour pen
  - Pump out cap
- Wait 10 minutes for complete disinfection

STATUS:

- Over 100 Pen prototypes manufactured and tested
  - Extensive laboratory testing on microbial and chemical contaminant removal validated performance passed EPA protocol for hand held purifiers
  - Successful Performance during AIR Force (AFOTEC) Technical Maturity assessment
- Prototype cap fabricated to work with outdoor industry standard nalgene container openings
- Marine Corps Marine Enhancement Program underway
- MIOX teaming with Cascade Designs to develop, manufacture, and market commercial cap meeting outdoor enthusiast and military requirements
- Expected in commercial market place in 12 months
- **PM funded development of Large-scale version for 3,000 GPH ROWPU**
- Undergoing testing at TARDEC for technology insertion

Rapidly Installed Fuel Transfer System (RIFTS)

- Rapidly emplaced, high volume bulk liquid transfer system capable of installation at a rate of 20 miles per day (30 MPD objective) using minimal personnel and equipment assets.
- A rapid deployable/re-deployable bulk liquid transfer capability that maintains pace with changing battlefield operations and requirements.
- Capability to replace bulk liquid transportation by truck; frees assets for retail petroleum re-supply and other CSS operations
- Capability for quick replacement of damaged in-theater pipeline infrastructure and flexible augmentation.
- Capability to move large volume of liquid (1 million GPD) to intermediate and head storage terminals using minimal manpower.
- Deployable over terrain not navigable by bulk fuel tankers.
- **R&D but no production dollars**

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
CTD Phase	△ MS A			△ MS B			
Deploy/Retrieve Demo							
Components Dev (Cont'd)							
Contract (Baseline Sys)							
DT/User System Demo							
SDD Phase/LRIP					△ MS C Prod Rel		
System Contract							
PVT/IOTE							
Production Phase							

PETROLEUM TEST KIT (PTK)

- Suitcase size capability replaces both Aviation Fuel Contamination Test Kit (AFCTK) and Ground Fuels Test Kit (GFTK)
- Provides a Red/Amber/Green indication of diesel and turbine fuels
- **R&D but no production dollars**

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
Early User Evaluation	△						
System Spec	△						
MS B Approval	△						
RFP Released	△						
SDD Contract Award	△						
DT/OT							
MS C Approval		△					
Production							

Water Purification Systems

1500 Tactical Water Purification System (TWPS)

- Produces Potable Water From All Water Sources Including NBC Contaminated Sites
  - Capable of Producing Potable Water from 60,000 mg/l TDS Source
- Two configurations
  - **Army**
    - Basic Unit includes TWPS Plus Add-On Modules for Cold Weather, Chemical Cleaning Wastewater Storage, Supplemental Potable Water Storage and Distribution, Ocean Intake
    - ISO Flat Rack Configured, 23,300 lbs. includes; TWPS mounted onto Flat-rack, Generator Set, and All Modules. Systems can be stacked 3 high for transport on ship.
  - **Marine Corps**
    - Basic Unit includes TWIPS only
    - Skid System to Fit in 8′x8′x20′ ISO Container, 10,000 lbs.

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
Prod. Call ups		△	△	△	△	△	
PVT	▭						
IOT&E	▭						
MR / TC STd.		△					
FUE		△					

Lightweight Water Purifier (LWP)

- Produces Potable Water From All Water Sources Including NBC Contaminated Sites
- Provides 75 GPH From Seawater and 125 GPH From Fresh Water Source
- Weighs Approx. 2000 Lbs. Without Ramp/Monster Hand Truck
- HMMWV and UH-60 Transportable
- Issued in AAL TRICON
- Set-Up by Four Soldiers, Operated by One

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
Logistics Demo	△						
PVT	▭						
IOT&E		▭					
Full-Rate Production IPR		△					
Production Call-Ups		△	△	△	△		
FUE			△				

Distribution Systems

Unit Water Pod System (Camel)

- 900 Gallon Water Storage Capacity, Heat/Chill Capability, & M1095 (GFE) MTV Trailer
- Heater/Chiller permits operation in hot and cold climates
- Increased Water Capacity verses current systems Reduces Battlefield Re-Supply
- Retail dispensing, transport full & partial loads, Fully capable of stand-alone operation
- Meets ANSI/NSF Water Standards for Potable Water
- Inter-theater transported by highway, rail, air, & marine
- Transport in C-130 & larger aircraft
- External by helicopter & low-velocity air droppable
- Payload NBC Survivable

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
MS B MDA Approved							
Contract Award	△						
SDD Phase	△						
Government Test:	△						
POT		▭					
POT Safety Release		△					
CT - Customer		▭					
MS C MDA Production Review		△					
LRIP Phase		△					
Government Test:		△					
Logistics Demo		▭					
PVT (FAT)			▭				
PVT Safety Release			△				
IOT&E			▭				
Full Rate Production Phase			△				
MS C/TC Standard			△				
FUE				△			

LHS Compatible Water Tank Rack (Hippo)

- ISO Configured, HEMTT-LHS / PLS Compatible
- 2,000 Gal. Cap. per Tankrack, 4,000 Gal. With Truck/ Trailer Combination
- Insulated Tank & Heater Will Permit Operation in Cold Weather Climates (-25 degrees F)
- Replacement For Current SMFT
- Provides Water Farther Forward Than the SMFT and Permits Transfer of Partial Loads

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
Prod. Contr. AWD				△			
Prod. Contr. Option AWD		△	△	△			
FAT		▭					
IOT&E- Customer Test		▭					
Full Rate Prod Decision/TC Std.		△					
Material Release		△					
First Unit Equipped		△					

Advanced Aviation Forward Area Refueling System (AAFARS)

- Provides Rapid, Simultaneous Refueling to Combat Aircraft Forward on the Battlefield
  - Refuels Four Aircraft Located 100′ Apart at 55 GPM
  - Modular Configuration - Four-Soldier Lift and Carry
  - System includes 12 500-gallon tanks
  - Issues in TRICON Containers
- Objective Force System
  - Aviation Detachment
  - FCS Interface

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
Contract Award	△	△	△	△	△	△	
FAT Units Completed	▲						
FAT Begins	▲						
FAT Evaluation/Approval	▲						
Production Build Begins	▲						
Material Release/TC Std		△					
FUE		△					

ASSAULT HOSELINE SYSTEM (AHS)

- A Mobile Petroleum Transport System
  - 350 GPM Pump
  - 14,000′ of 4″ Hose
  - Hose Deployment/Retrieval Capability
  - Couplings, Clamps, Slings, Valves, Etc.
  - TRICON
- Operational Concept
  - Rapidly Moves Bulk Fuel Forward
  - Eliminates/Reduces Needs for Fuel Trucks
  - Can Connect to IPDS and FSSP

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
Contract Award							
FAT/PVT		▭					
Material Release/ TC Std.			△				
FUE			△				
Production Call ups	▲	△	△	△	△	△	△

FUEL SYSTEM SUPPLY POINT (FSSP)

- A Bulk Petroleum Storage/Issue Point
  - Five Standard Configurations
  - Storage Capacity: 30K Gal. to 800K Gal.
  - Collapsible, Fabric Storage Tanks, Pumps,
  - Filter Seps., Fittings and Hoses
  - Containerized: TRICON / 20' ISO
- Operational Concept
  - The Primary System for Receiving, Issuing, and Storing Bulk Petroleum on the Battlefield

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
MS C/TC GEN	▲						
CONTRACT AWARD	△						
FIRST ARTICLE		▭					
TEST & DEM		▭					
LOG DEMO		▭					
FULL RATE PROD		△					
MATERIEL RELEASE/TC STD			△				
FIRST UNIT EQUIP			△				
DEPLOYMENTS			▭				

LHS Compatible Modular Fuel Farm (LMFF)

- ISO Configured, HEMTT Load Handling System (LHS) Compatible
- 35,000 Gallon System Consists of Fourteen 2500-Gal Tankracks plus Two Pumpracks
- Pumprack Consists of a Pump, Filter-Separator and Hose Storage
- LMFF Increases Mobility, Capacity and Speed in Fuel Distribution
- LMFF Decreases Set-up and Take-Down Time
- NATO and PLS Flatrack Compatible
- Tankracks Also Suitable for Line Haul Operations

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
MS C / TC LRIP	△						
Full Rate Prod Decision			△				
Prod. Contr. AWD		△					
Prod. Contr. Option AWD			△	△	△	△	△
FAT		▭					
IOT&E- Customer Test			▭				
MR / TC STd.			△				
First Unit Equipped			△				

Quality Surveillance

Petroleum Quality Analysis System (PQAS)

- One Per Division and Separate Brigades
- PQAS Replaces Air Mobile Lab on 1:1 Basis
- Contains Computer Integrated Test and Data Acquisition Instruments for Fuel Analysis
- Contained in Lightweight Expandable Shelter Mounted on HMMWV
- Provides Capability for Quality Surveillance Tests on Diesel and Turbine Fuels by One 77L Soldier per 10 Hr. Shift.
- Digitization
  - Perform Necessary Calculations and Data Manipulations
  - Transmit Fuel Test Results
- Transportable by C-130 or Externally Transported by CH-47C/D

Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
Prototypes							
DT/OT							
MS C (STD)	△						
Prod Optn Awd	△						
Materiel Release		△					
FUE		△					

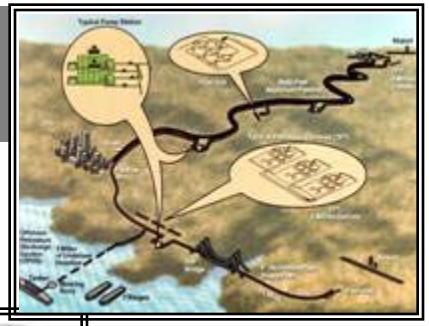
MODULAR BASE PETROLEUM LABORATORY (MBPL)

- Operates At Theatre Level
- Performs Petroleum Tests Described by MIL-STD 3004
- Consists Of Two Semi-trailer Laboratories and Power Distribution Module

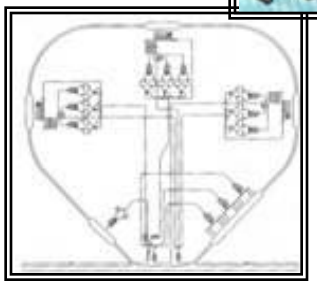
Milestones	FY03	FY04	FY05	FY06	FY07	FY08	FY09
ECP Contract Award	△						
TC Standard	△						
MR	△						
FUE	△						

IPDS

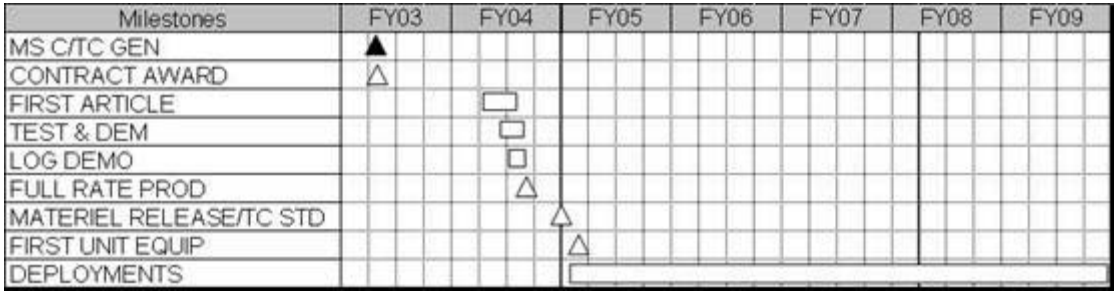
INLAND PETROLEUM DISTRIBUTION SYSTEM (IPDS)



Tactical Petroleum Terminal (TPT) Fuel Units and PLCAs



- A System for Rapid Deployment, General Support, Bulk-Fuel Storage, and Pipeline
- Worldwide Application to Provide Bulk Petroleum Fuels to Operating Forces Anywhere During Contingency Operations
- Major Groups of Equipment
  - **Tactical Petroleum Terminal**
    - Bulk Petroleum Storage System, Fuel Unit
    - PLCA
  - Pipeline System
    - Pipe set, 5 mile
    - Pipeline pump station
    - Pipeline support equipment
  - Special Purpose Equipment
    - Suspension bridge pipeline, 100ft, 200ft & 400ft
    - Critical Gap crossing pipeline
    - Pressure reducing station
    - Pressure relief module



Transitioned Items

Tank and Pump Unit (TPU)

- 31 January 2002

Forward Area Refueling Equipment (FARE)

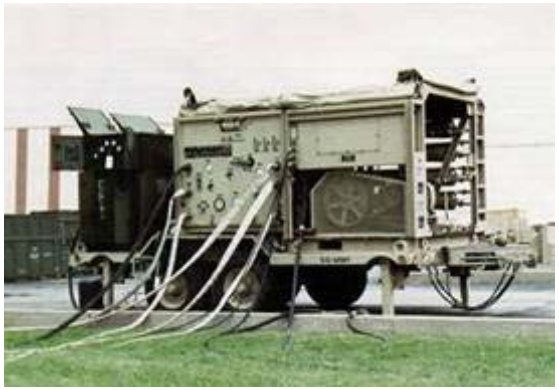
- 4 October 2001

HEMTT Tanker Aviation Refueling System (HTARS)

- 4 June 2001

600 GPH Reverse Osmosis Water Purification Unit (ROWPU)

- 4 October 2001



3000 GPH Reverse Osmosis Water Purification Unit (ROWPU)

- 31 January 2002

Summary

Continue to Field Systems

Support to WARFIGHTERS

Deployability of Systems

Field Systems to Standard

Production Contracts

Remain Relevant

Active in Transformation

Continue R&D Efforts

Change of Management June 03

LTC Francisco Espaillat

It's been a Fun 3 Years

Thank You

For Your Support !